MK 83 WARHEAD EFFECTIVENESS TESTS

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[Slide l has the title "Obstacle Breaching System Mk 83 Warhead Effectiveness Test" and the Coastal Systems Station (CSS) logo alongside the Naval Sea Systems Command, Mine Warfare
Systems Division PMO 407 logo.]

Background: The Coastal Systems Station has been tasked by the Naval Sea Systems Command (NAVSEASYSCOM) Program Engineering Office 407 (PMO 407), Mine Warfare Systems, to develop Shallow Water Mine Countermeasure (SWMCM) systems that will clear mines and obstacles in a lane from the sea onto the high water mark on the beach at the beginning of an amphibious assault. One of these SWMCM projects, Obstacle Breaching System (OBS), is tasked to remove all man-made and natural obstacles in-stride at the beginning of an amphibious assault.

The Obstacle Breaching System Project first evaluated existing munition systems already in the Department of Defense (DoD) inventory and concluded that the Mk 83 Bomb in the Air Inflatable Retarder (AIR) configuration held the most promise to explosively clear obstacles in a lane. Mk 83 Warheads were obtained and statically tested on land and in the water at Eglin Air Force Base (AFB) in Fort Walton Beach, Florida from March 17 to December l, 1993. The test results are described in the Mk 83 Final Test Report, dated June 1994.

[Slide 2 is a quad chart depicting a Mk 83 detonation in the water, the purpose of the tests, a short history of the tests, and a picture of a Mk 83 detonation on land.]

Purpose: The purpose of the Mk 83 Warhead Effectiveness Tests were to determine the kill radius of the Mk 83 bomb against various obstacle types on land and in the water, verify, previous analysis and modeling of the Mk 83's effectiveness in obstacle clearance, and to determine cratering effects of a Mk 83 detonation.

[Slide 3 depicts the seven obstacle types that comprise the Obstacle Breaching System Target Baseline: Concrete Cube, Steel Hedgehog, Steel Tetrahedron, Concrete Jersey Barrier, Wood Log Posts, Concertina Wire, and Engineer Stake Jack.]

Report Documentation Page

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14. ABSTRACT

15. SUBJECT TERMS

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[Slide 4 depicts the schedule of the Mk 83 Warhead Effectiveness Tests at Eglin AFB along with the costs of the tests.]

[Slide 5 summarizes the Mk 83 Warhead Effectiveness Test events.]

Schedule: The Mk 83 Warhead Effectiveness Tests consisted of 28 test events on land and 41 test events in the water. The test events were conducted from March 17, 1993 to December l, 1994. The land test events were conducted at Eglin AFB Test Range B-75 and the water test events were conducted at the SWMCM Test Pond located at Eglin AFB test range B?.

[Slide 6 depicts the SWMCM Test Pond at Eglin AFB]

[Slide 7 depicts the B-75 test range at Eglin AFB, showing the four test pads, the remote camera placement, the Closed Circuit TV (CCTV) control van, the Explosive Ordnance Deployment (EOD) personnel, and the testing personnel.]

Test Description: The land tests were performed at Eglin AFB's Test Range B-75, which consisted of two test pads on either side of an access road. This arrangement allowed the testing of up to four test events (two on each test pad with sufficient separation between the test areas) with a single setup. A remotely operated closed circuit TV (CCTV) camera was placed strategically on the access road so that all four test events could be performed without a new setup. The CCTV camera was a high speed camera that was shielded at the test site and used mirrors to film each test event. A video capture and playback unit in the CCTV control van allowed the test director and EOD personnel to view each test event remotely to verify that a detonation took place or give advance information on a dud event.

The access road was closely controlled by the EOD personnel and travel down to the test site after a test event was allowed only after EOD personnel cleared the area of any potentially unsafe conditions. The test director, CCTV control van, and EOD personnel employed communications equipment to keep in constant communication with each other before, during, and after each test event. This constant communication prevented accidents and oversights from taking place and prevented potentially harmful incidents from occurring.

[Slide 8 depicts the target layout for concrete jersey barriers and engineer stake jacks, triple standard concertina wire, steel tetrahedrons, and concrete cubes.]

Obstacle placement, debris removal, and test site landscaping was performed with heavy equipment, (e.g. front end loaders, cranes, etc.).

[Slide 9 depicts the pre- and post-test results of the land detonations of a concrete jersey barriers and engineer stake jacks test event and a wood log post test event.]

[Slide 10 depicts the pre- and post-test results of the land detonations of steel hedgehogs test event and a steel tetrahedrons test event.]

Post-detonation scoring was accomplished with only certified personnel who were properly trained and equipped with the necessary safety equipment to handle steel shrapnel.

[Slide 11 depicts the SWMCM Test Pond]

The water phase of the Mk 83 Warhead Effectiveness Tests was conducted at the SWMCM Test Pond at Eglin AFB's B-70 Test Range. Adjacent to the SWMCM Test Pond is a fill pond with an exposed liner for the water that's pumped into the SWMCM Test Pond, with an access road in between. Two pumping units are located on the access road and had to be removed by heavy crane before each detonation in the test pond.

When planning out a test event, all obstacles closest to the Mk 83 warhead were situated away from the fill pond and two pumping units so that any damage by debris would be minimal.

[Slide 12 depicts the pre- and post-test results of steel hedgehogs and concrete jersey barriers.]

For additional protection, a 12 inch by 12 inch steel plate was placed under the node of the Mk 83 warhead to prevent a "shaped charge" effect from damaging the test pond liner and leach filed underneath the test pond.

[Slide 13 depicts the pre- and post-test results of the wood log posts and triple standard concertina wire.]

[Slide 14 depicts the pre-and post-test results of steel tetrahedrons and concrete cubes.]

[Slide 15 depicts the Mk 83 warhead arena pressure tests.]

Some additional tests were added to the test series when the Joint Munitions Effectiveness Manual (JMEMs) Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) were briefed about the current Mk 83 Warhead Effectiveness Tests. The JTCG/ME co-sponsored the tests and the pressure wave characteristics about the Mk 83 warhead were determined.

[Slide 16 depicts the Mk 83 Warhead Effectiveness Test Follow-On Target Layout.]

After the Mk 83 Warhead Effectiveness Tests were completed, on-going analysis indicated that placement of the obstacles might have an effect on the results, so two obstacle types (concrete cubes and concrete jersey barriers) were selected to be placed in less-than-ideal positions to investigate the effects of placing the obstacles edge-forward (vs. braod sided) and what effects shadowing caused.

[Slide 17 depicts the pre- and post-test results from the land phase of the Mk 83 Follow-On Tests with concrete cubes and concrete jersey barriers.]

[Slide 18 depicts the pre- and post-test results from the water phase of the Mk 83 Follow-On Tests with concrete cubes and concrete jersey barriers.]

There were no changes in any of the safety procedures for the Mk 83 Warhead Follow-On Tests.

VIEWGRAPH 1
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST

CSS

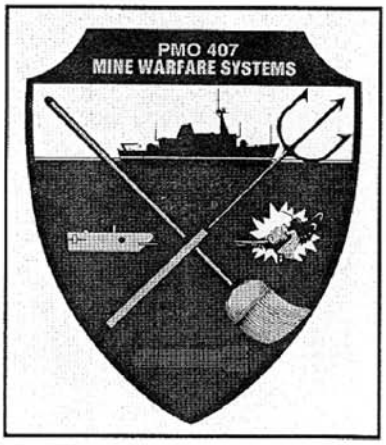
0694-6571

OBSTACLE BREACHING SYSTEM

MK83 WARHEAD EFFECTIVENESS TEST

COASTAL SYSTEMS STATION
CSS
DAHLGREN DIVISION
NAVAL SURFACE WARFARE CENTER
PANAMA CITY, FLORIDA

PMO 407
MINE WARFARE SYSTEMS



VIEWGRAPH 2
OBSTACLE BREACHING SYSTEM (OBS) PROJECT
MK83 WARHEAD EFFECTIVENESS TEST

CSS

R0894-6574

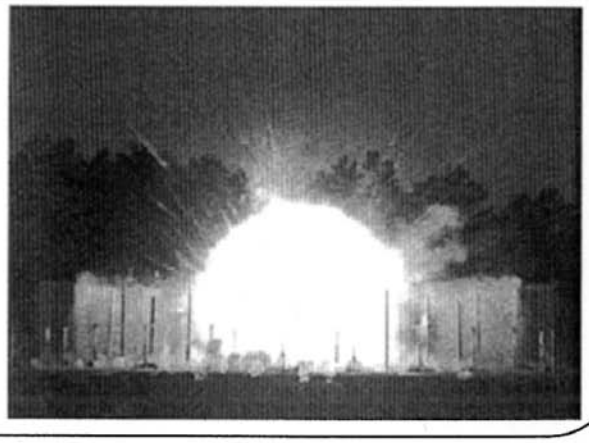
OBSTACLE BREACHING SYSTEM (OBS) PROJECT

MK 83 WARHEAD EFFECTIVENESS TESTS

- DETERMINE THE CLEARANCE RADIUS OF THE MK 83 AGAINST VARIOUS OBSTACLES ON LAND AND IN THE WATER
- VERIFY ASI-SIs PREVIOUS MODELING AND ANALYSIS OF THE MK 83s EFFECTIVENESS
- DETERMINE CRATERING EFFECTS BY MK 83

HISTORY

- SURVEY EXISTING DoD SYSTEMS FOR OBSTACLE CLEARANCE CAPABILITY
- NAWC/CL AND ASI-SI TRADE-OFF STUDY RECOMMEND MK 83 FOR OBSTACLE CLEARANCE
- MK 83 WARHEAD EFFECTIVENESS TESTED AGAINST OBSTACLE BASELINE
- ALTERNATE SYSTEM CONCEPTS EVALUATED TO INCREASE CLEARANCE CAPABILITY



COASTAL SYSTEMS STATION - PANAMA CITY, FLORIDA

VIEWGRAPH 3
OBSTACLE BREACHING SYSTEM (OBS) PROJECT
MK83 WARHEAD EFFECTIVENESS TEST SCHEDULE

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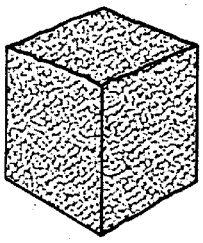
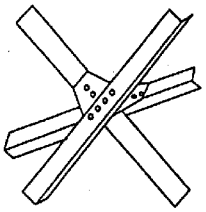
OBSTACLE BREACHING SYSTEM TARGET BASELINE



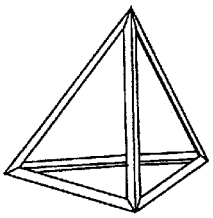
CONCRETE CUBE

- 4X4X4 FT SOLID CUBE
- 3000 PSI CONCRETE
- WEIGHT APPROX. 5 TONS



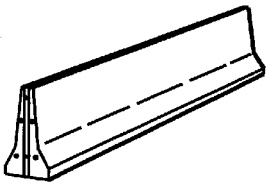
STEEL HEDGEHOG

- 4X4X3/8 INCH ANGLE IRON
- EACH LEG 4 FT LONG
- BOLTED OR WELDED



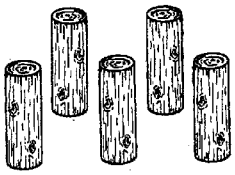
STEEL TETRAHEDRON

- 4X4X5/8 INCH ANGLE IRON
- EACH LEG 5 FT LONG
- WELDED



JERSEY BARRIER

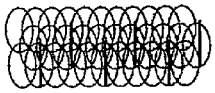
- REINFORCED CONCRETE
- 12 FOOT LENGTH MINIMUM
- 2.75 FOOT TALL



LOG POSTS

- 30 - 48 INCHES ABOVE GROUND
- MINIMUM 16 INCHES DIAMETER
- 5 FT BURIAL
- HARDWOOD LOGS OR TELEPHONE POLES

SINGLE CONCERTINA



TRIPLE STANDARD CONCERTINA

CONCERTINA WIRE

- 36 INCH DIAMETER (EACH ROLL)
- MOST COMMON AS TRIPLE STANDARD CONCERTINA
- STEEL ENGINEER STAKES EVERY 12.5 FT

ENGINEER STAKE JACK

- 6 FT ENGINEER STAKES CROSSED AT 60 DEGREES AND SPOT WELDED
- 12 FT ENGINEER STAKE SPOT WELDED ON TOP OF CROSSED STAKES
- 4.3 FT HIGH, 5 FT WIDE, 12 FT LONG

VIEWGRAPH 4
OBSTACLE BREACHING SYSTEM
TARGET BASELINE

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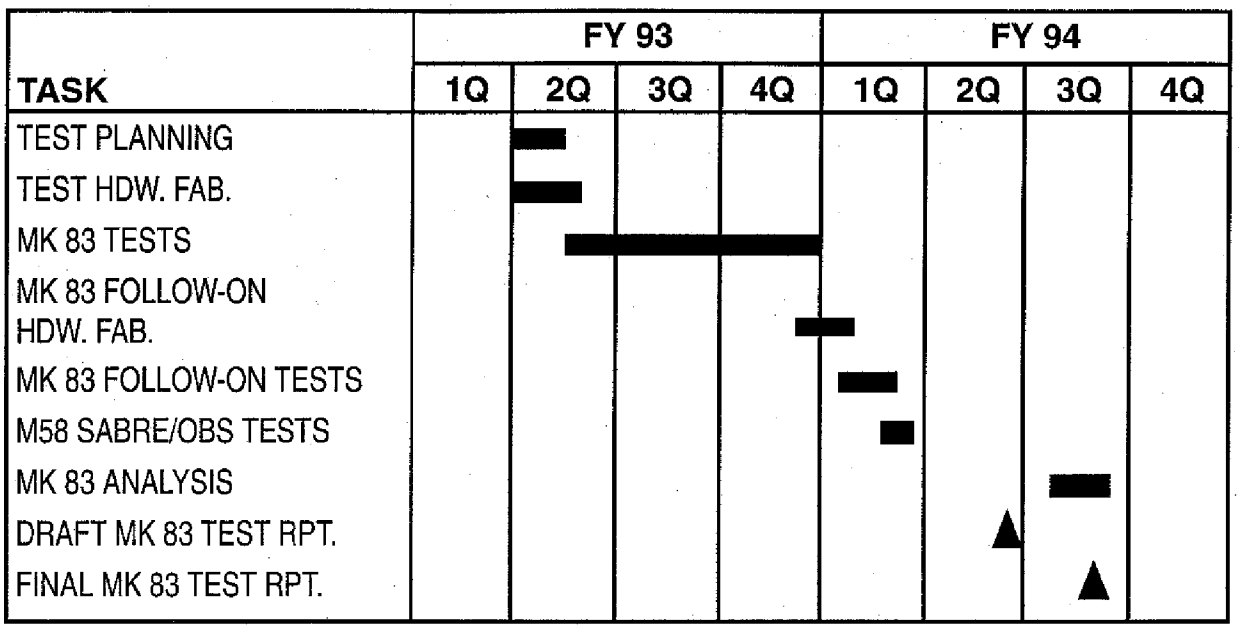
OBSTACLE BREACHING SYSTEM

MK 83 WARHEAD EFFECTIVENESS TEST SCHEDULE



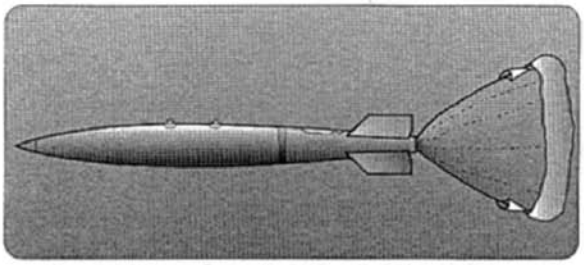
VIEWGRAPH 5
OBSTACLE BREACHING MUNITION

CSS

0793-5483

OBSTACLE BREACHING MUNITION

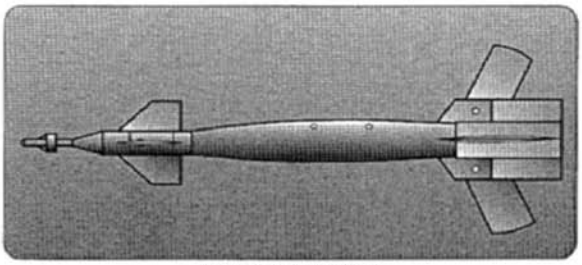
I. PRIMARY WEAPON



MK 83 WITH BSU-85/B AIR-INFLATABLE RETARDER (MK 83 AIR)

TOTAL MK 83 AIR WEIGHT (LB)	1022
NOMINAL EXPLOSIVE WEIGHT (LB) H-6 OR TRITONOL OR PBX-109	416
LENGTH, ASSEMBLED (IN)	118.0
BODY DIAMETER (IN)	14.0
FIN SPAN (IN)	20.4

II. CLEAN-UP WEAPON



GBU-16 (PAVEWAY II)

NOMINAL TOTAL WEIGHT (LB)	1100
WARHEAD	MK 83
NOMINAL EXPLOSIVE WEIGHT (LB) H-6 OR PBX-109	416
LENGTH, ASSEMBLED (IN)	144.9
BODY DIAMETER (IN)	14.0
WING CONFIGURATION (IN) FOLDED	26.0
OPEN	63.6

COASTAL SYSTEMS STATION - PANAMA CITY, FLORIDA

VIEWGRAPH 6
MK83 WARHEAD EFFECTIVENESS
SUMMARY

CSS

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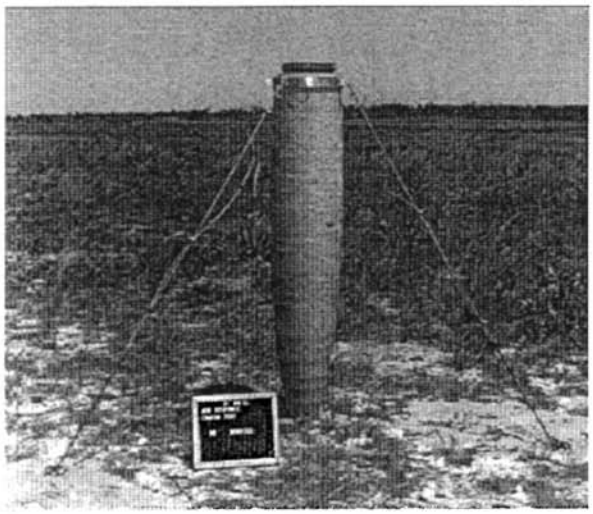
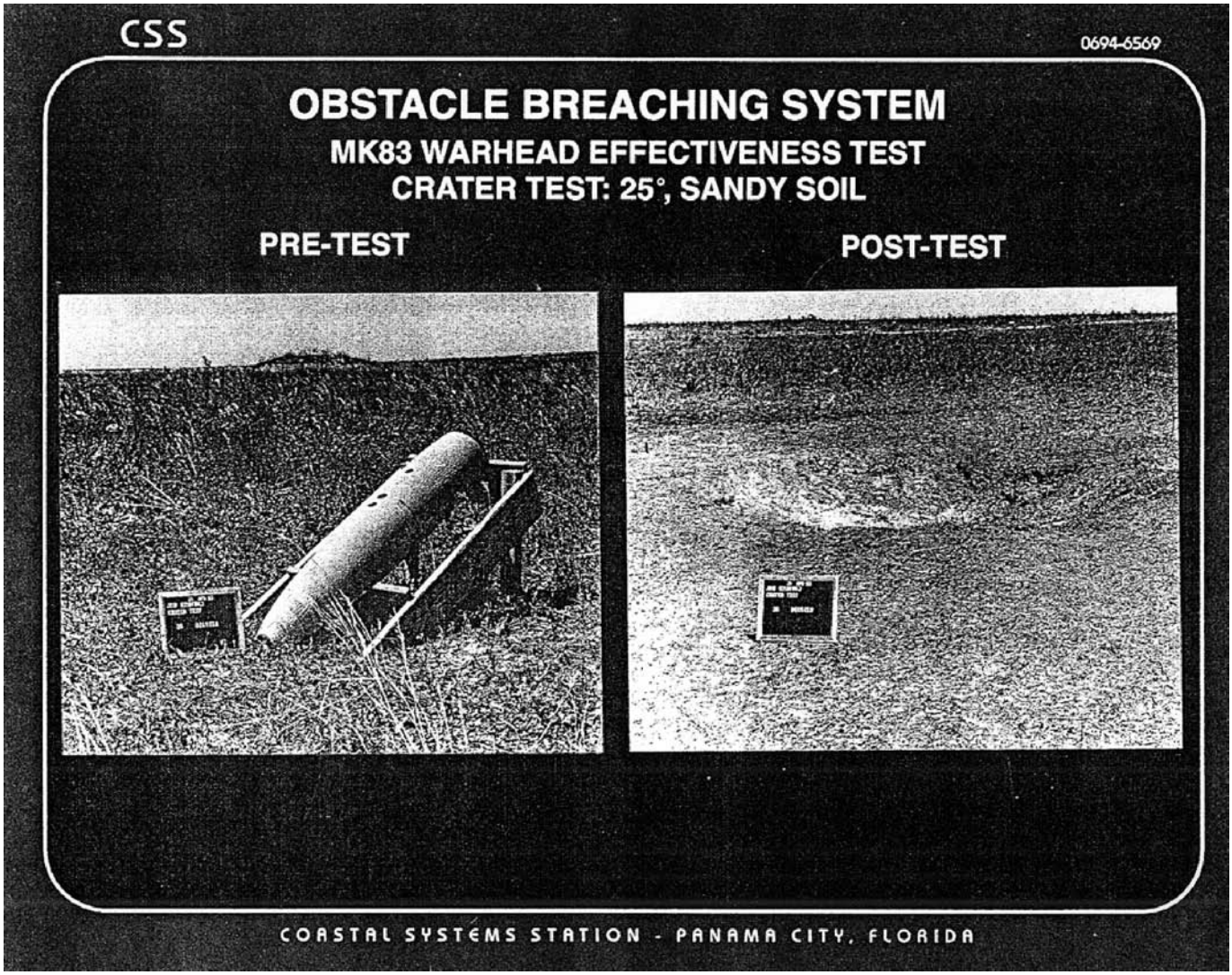
MK 83 WARHEAD EFFECTIVENESS SUMMARY



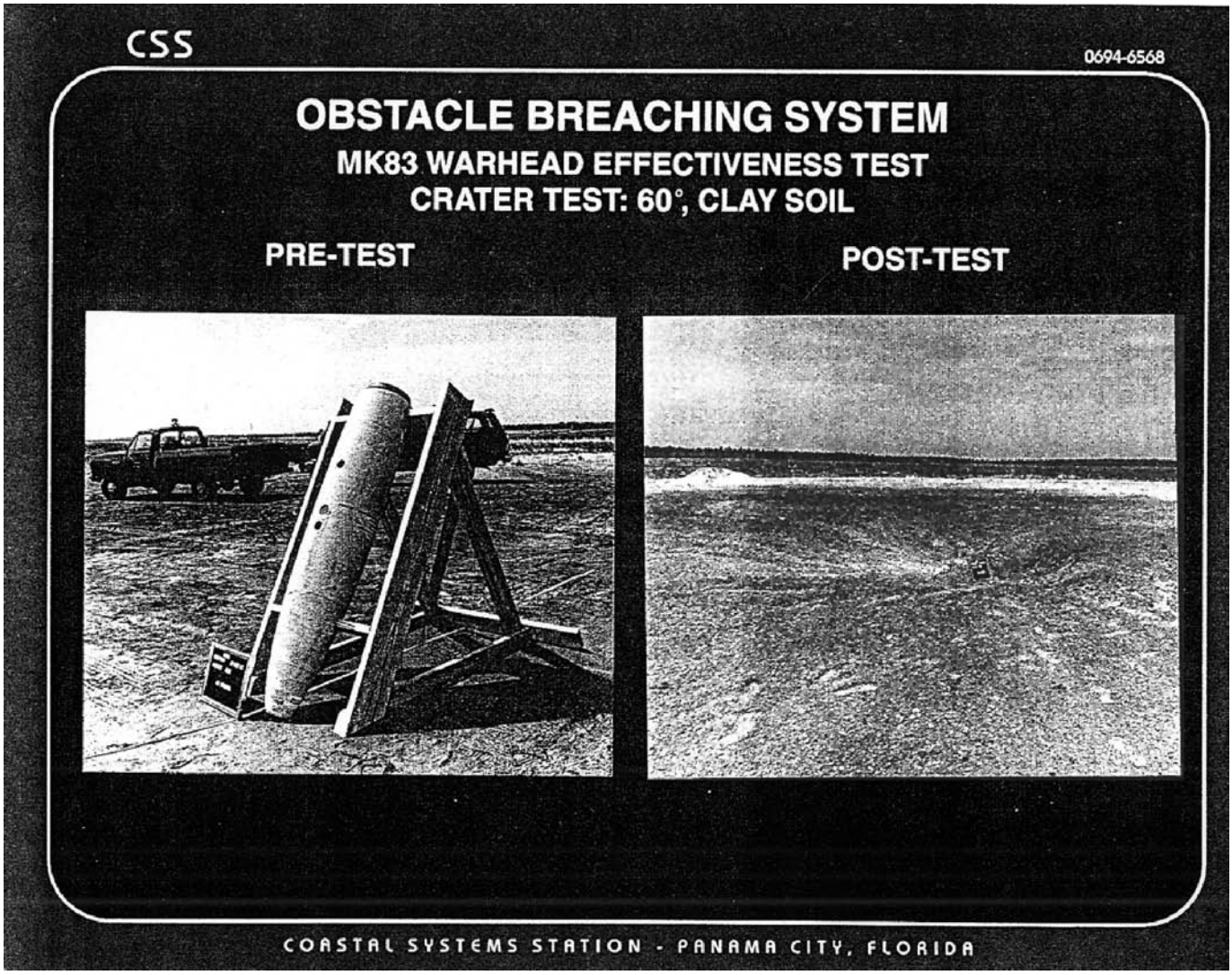
- 28 TEST EVENTS ON LAND
- 41 TEST EVENTS IN WATER
- TESTED AGAINST OBSTACLE TARGET BASELINE
  - CONCRETE CUBE
  - STEEL TETRAHEDRON
  - STEEL HEDGEHOG
  - WOOD LOG POST
  - TRIPLE STANDARD CONCERTINA WIRE
  - ENGINEER STAKE JACKS
  - JERSEY BARRIER
- CONDUCTED CRATER TESTS AT 25^{O}, 60^{O}, 90^{O}, ON SANDY AND CLAY SURFACES
- CHARACTERIZED MK 83 BLAST WAVE

COASTAL SYSTEMS STATION - PANAMA CITY, FLORIDA

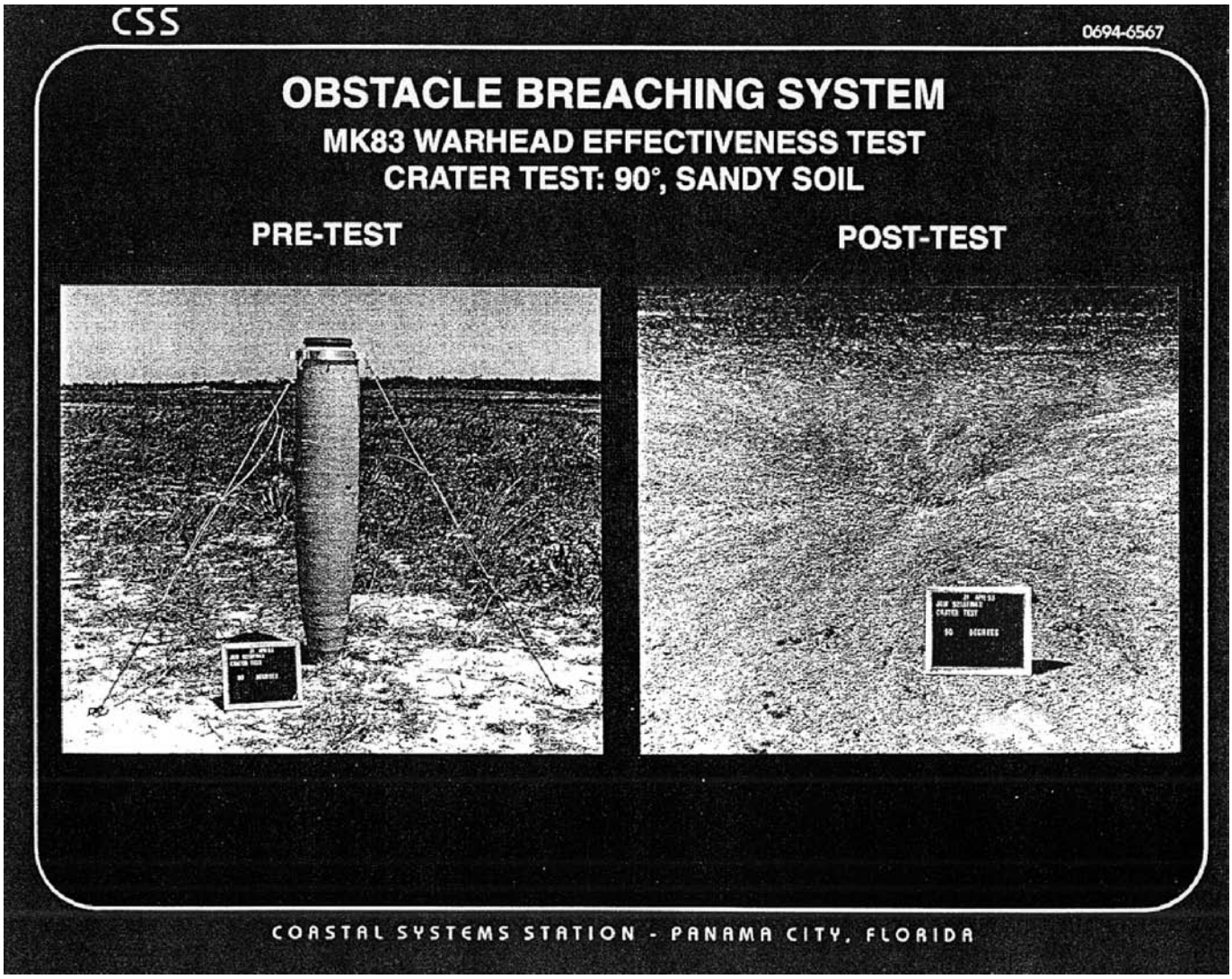
VIEWGRAPH 7
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
CRATER TEST:25°, SANDY SOIL



VIEWGRAPH 8
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
CRATER TEST: 60°, CLAY SOIL



VIEWGRAPH 9
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
CRATER TEST: 90°, SANDY SOIL



VIEWGRAPH 10
EGLIN A.F.B. TEST RANGE B75

CSS

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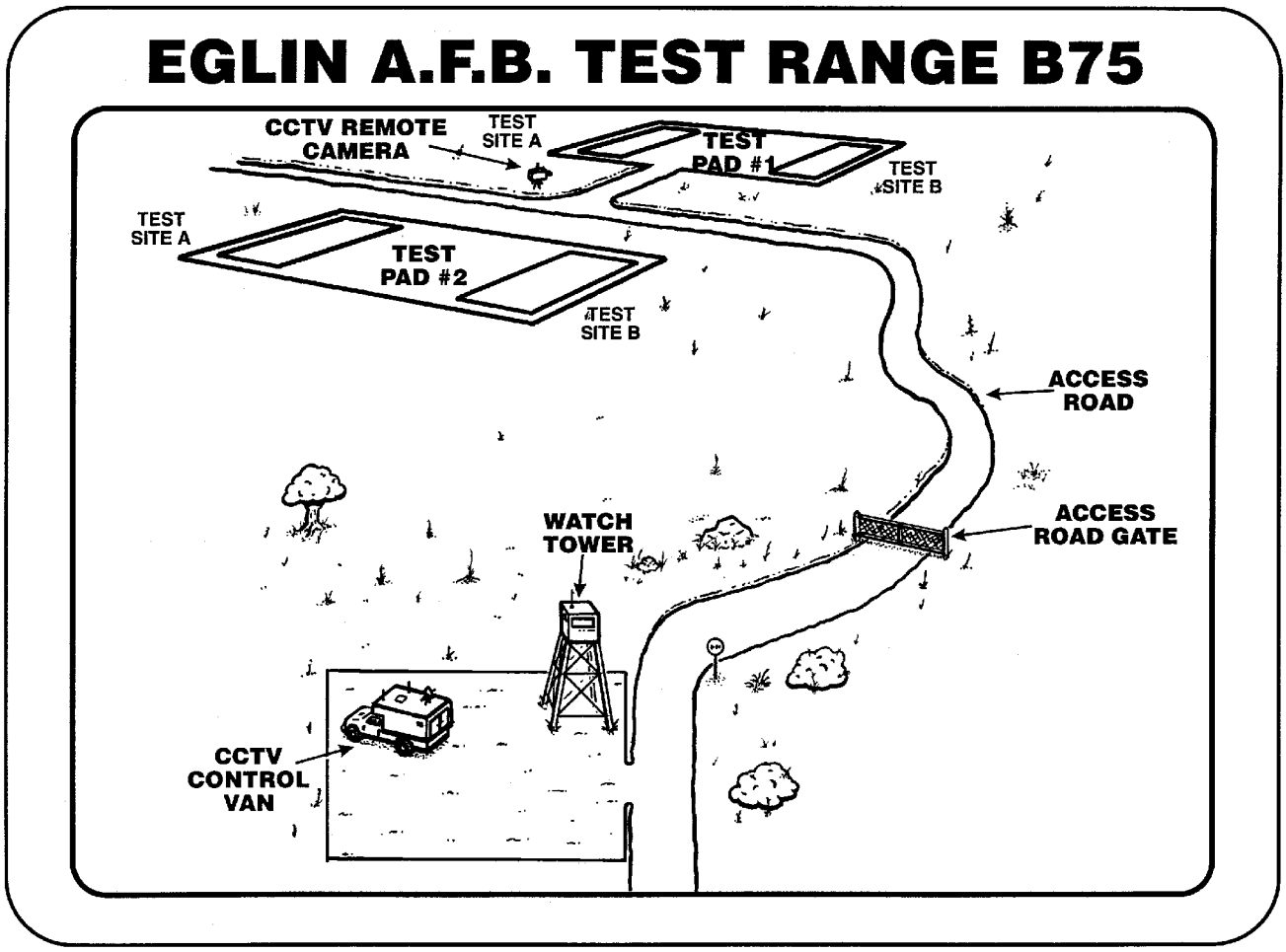

COASTAL SYSTEMS STATION - PANAMA CITY, FLORIDA

VIEWGRAPH 11
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
TARGET LAYOUT

CSS

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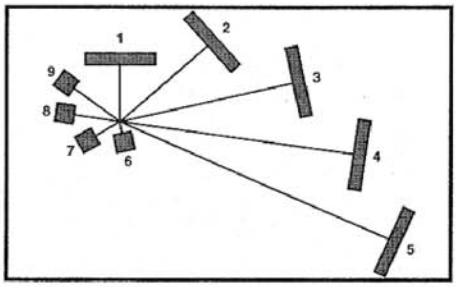
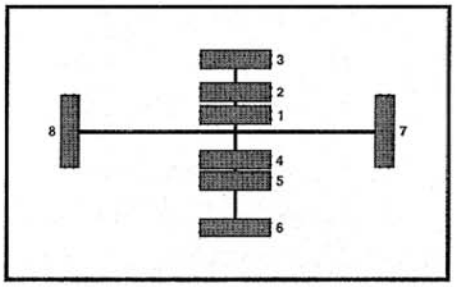
OBSTACLE BREACHING SYSTEM

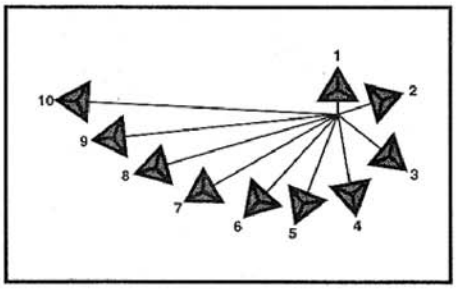
MK 83 WARHEAD EFFECTIVENESS TEST
TARGET LAYOUT



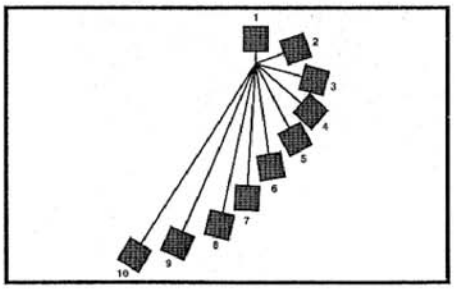
CONCRETE JERSEY BARRIERS
AND ENGINEER STAKE JACKS



TRIPLE STANDARD CONCERTINA WIRE



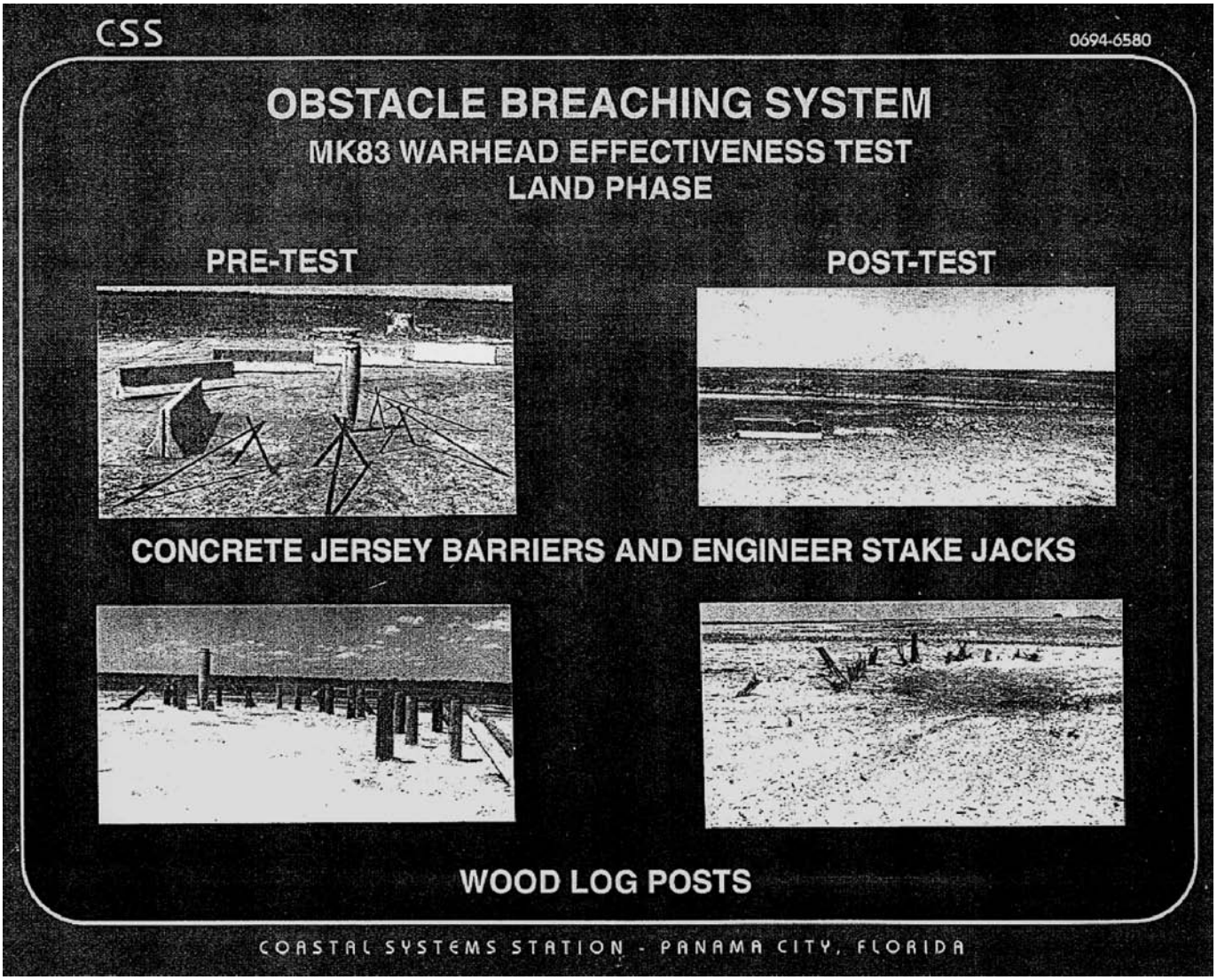
STEEL TETRAHEDRONS



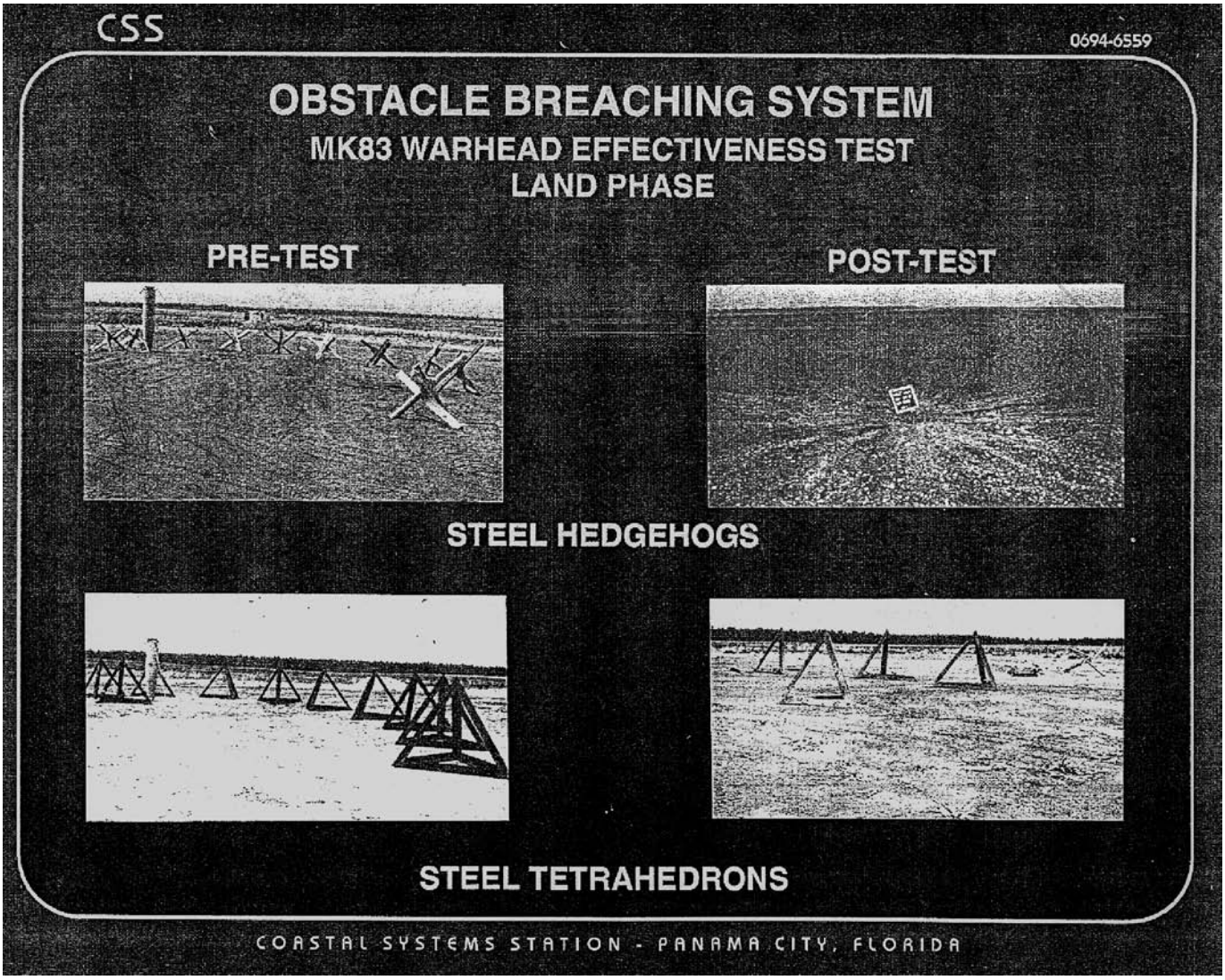
CONCRETE CUBES

COASTAL SYSTEMS STATION - PANAMA CITY, FLORIDA

VIEWGRAPH 12
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
LAND PHASE



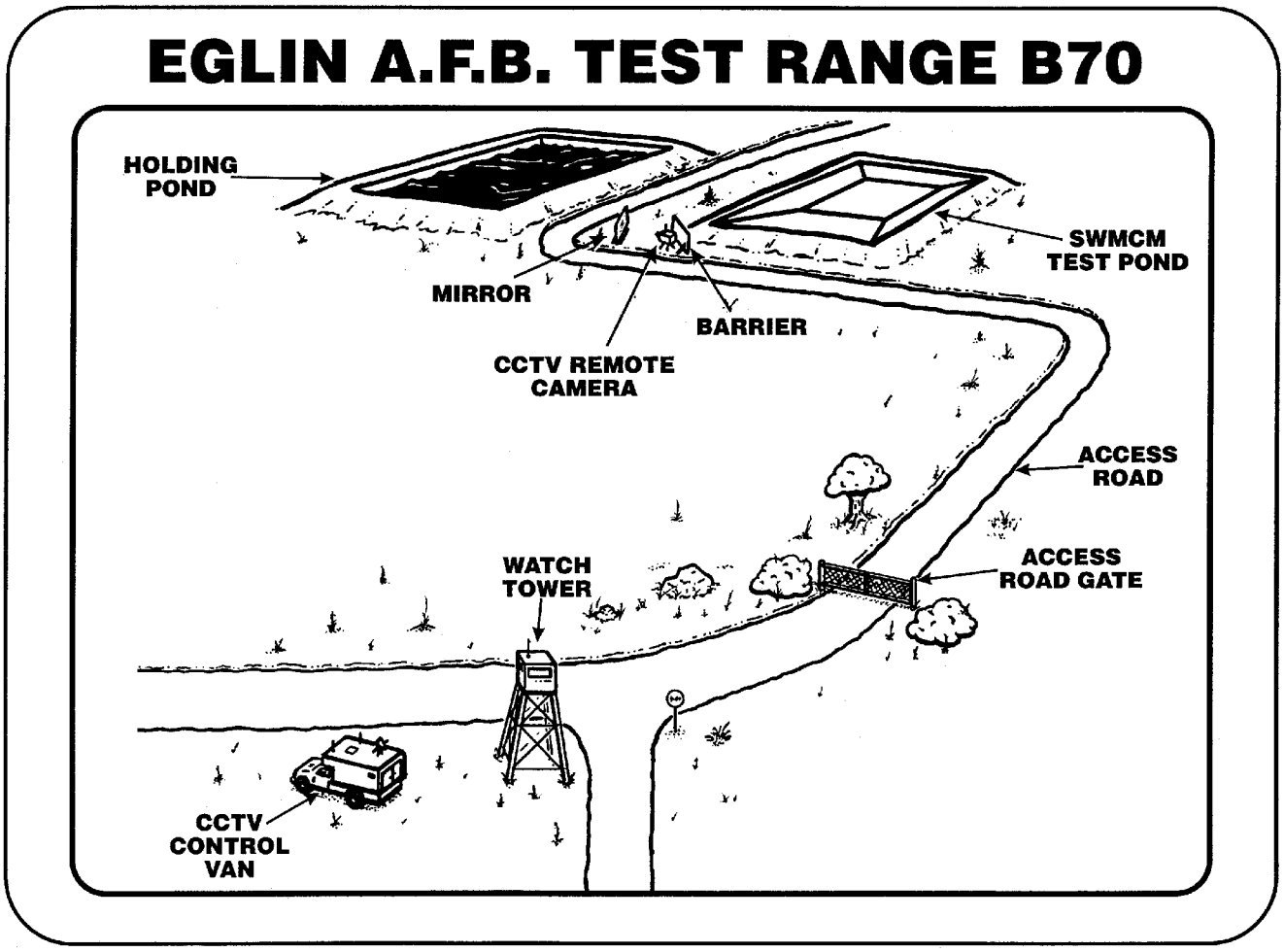
VIEWGRAPH 13
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
LAND PHASE



VIEWGRAPH 14
EGLIN A.F.B. TEST RANGE B70

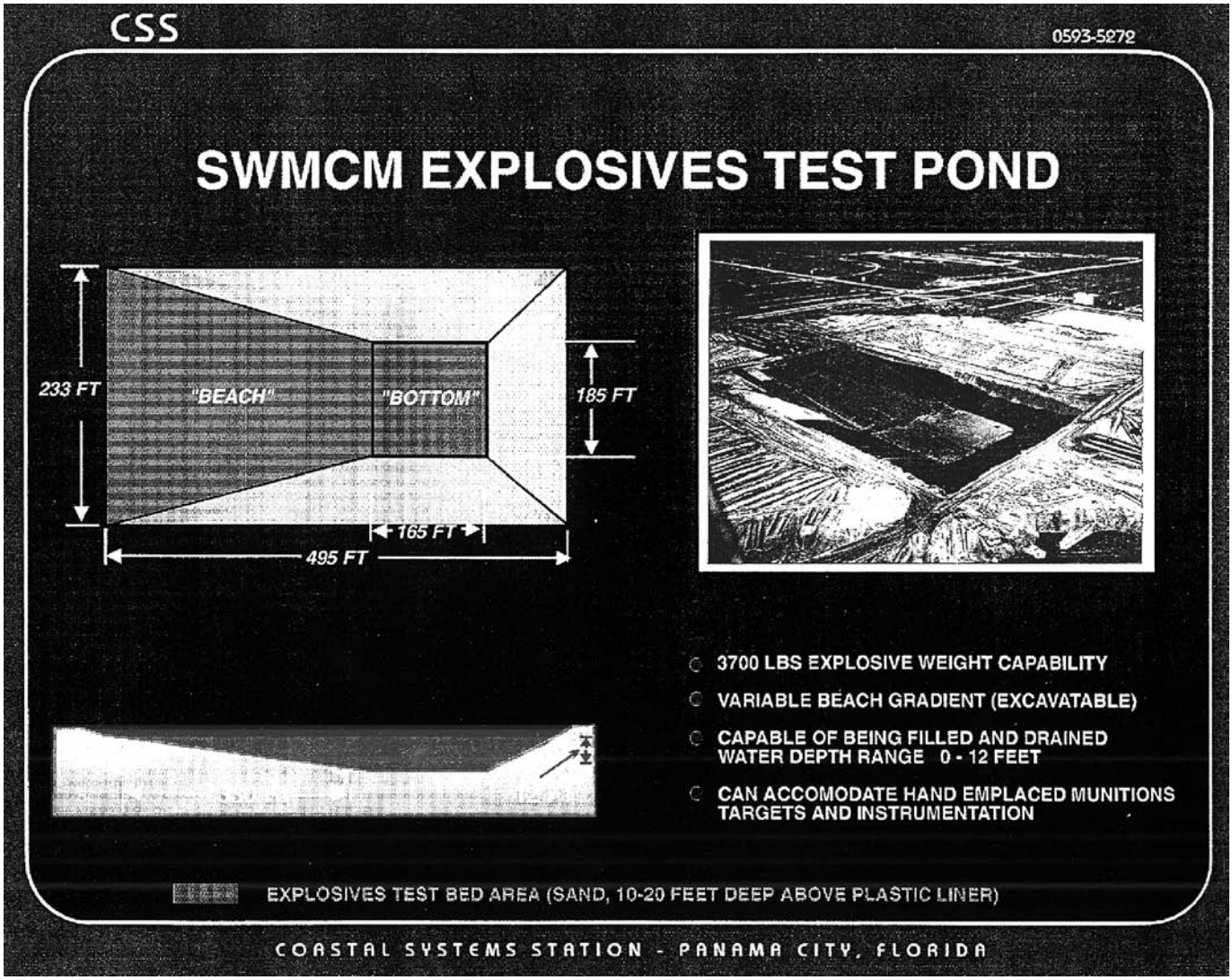
CSS

0894-6758

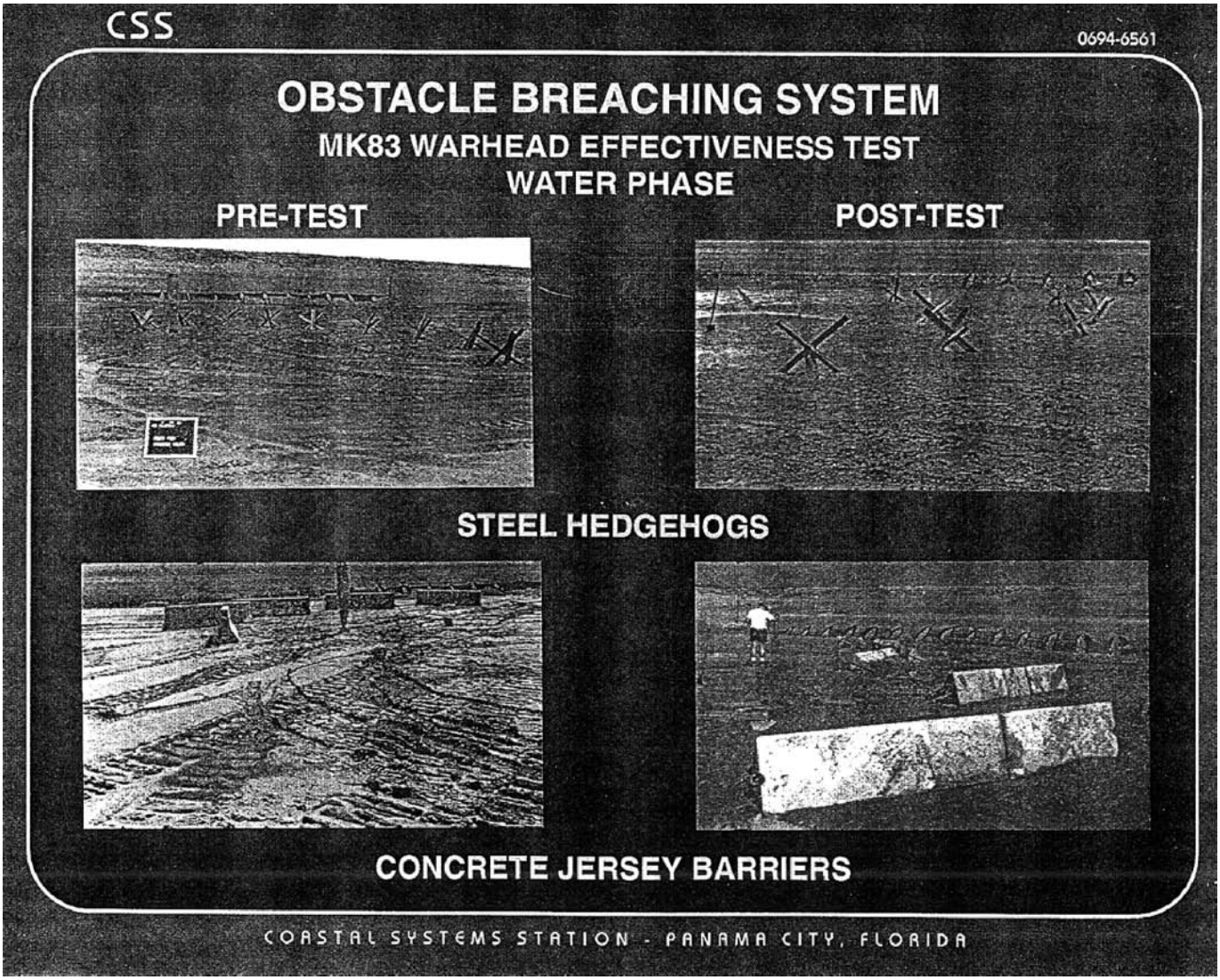


COASTAL SYSTEMS STATION - PANAMA CITY, FLORIDA

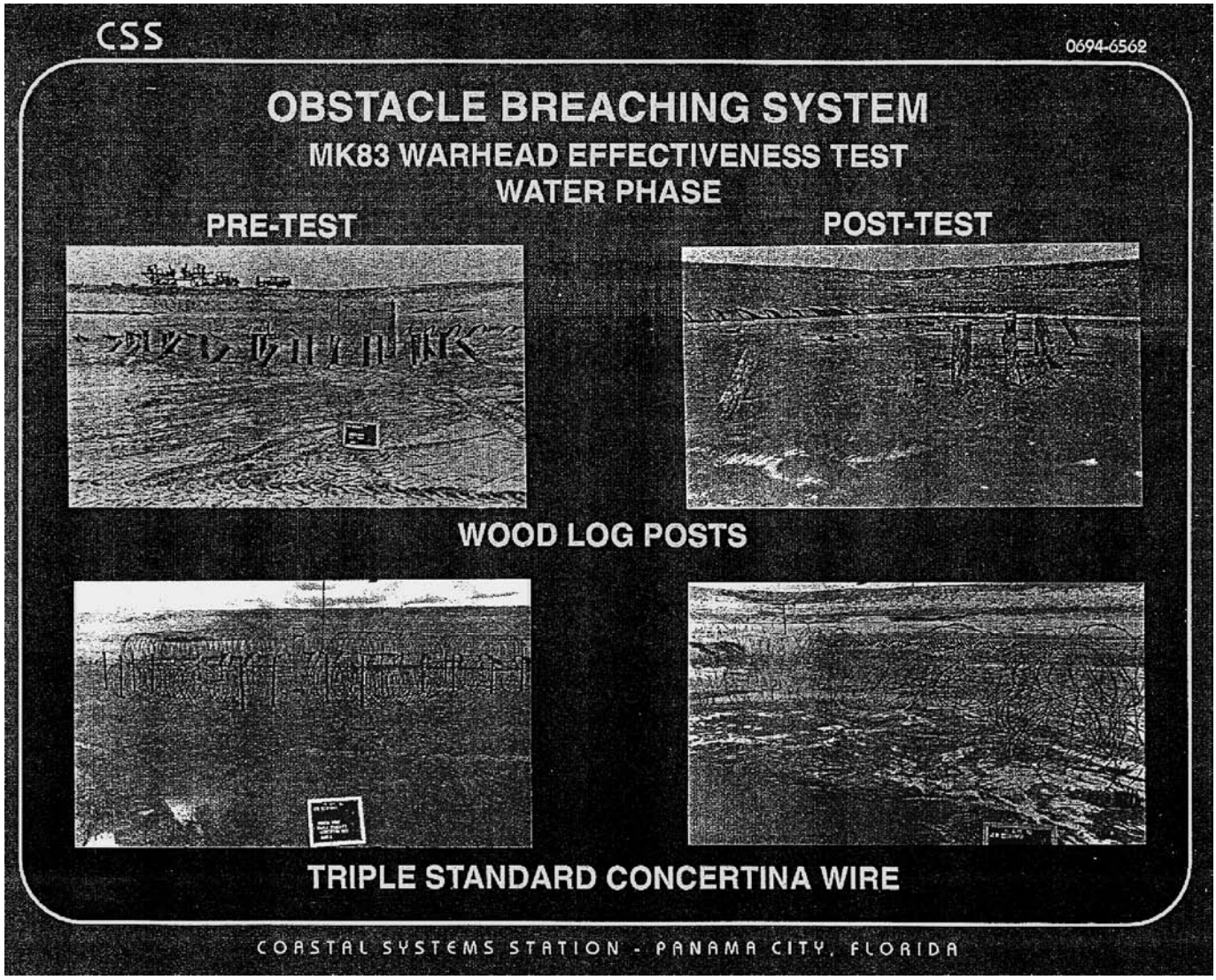
VIEWGRAPH 15
SWMCH EXPLOSIVES TEST POND



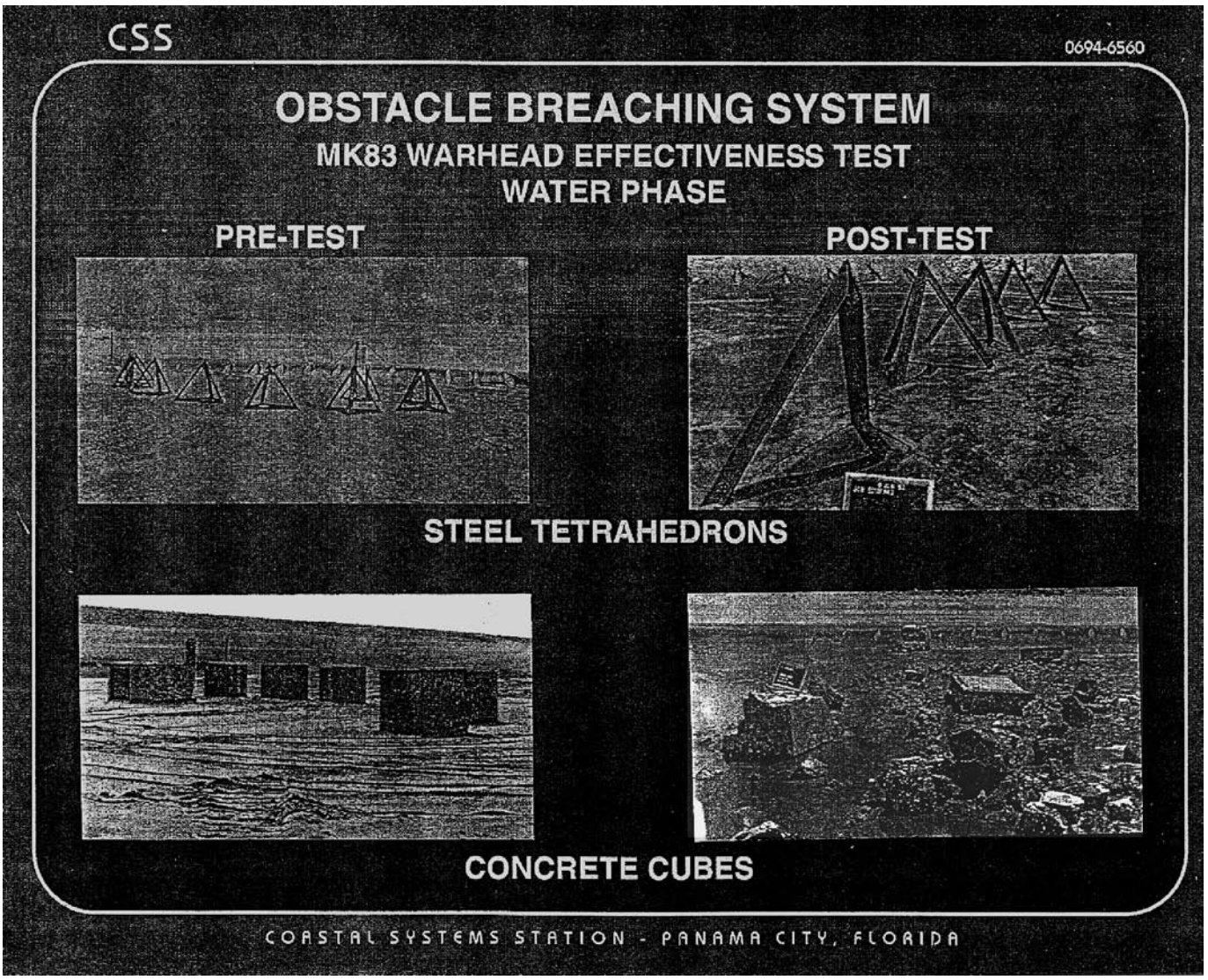
VIEWGRAPH 16
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
WATER PHASE



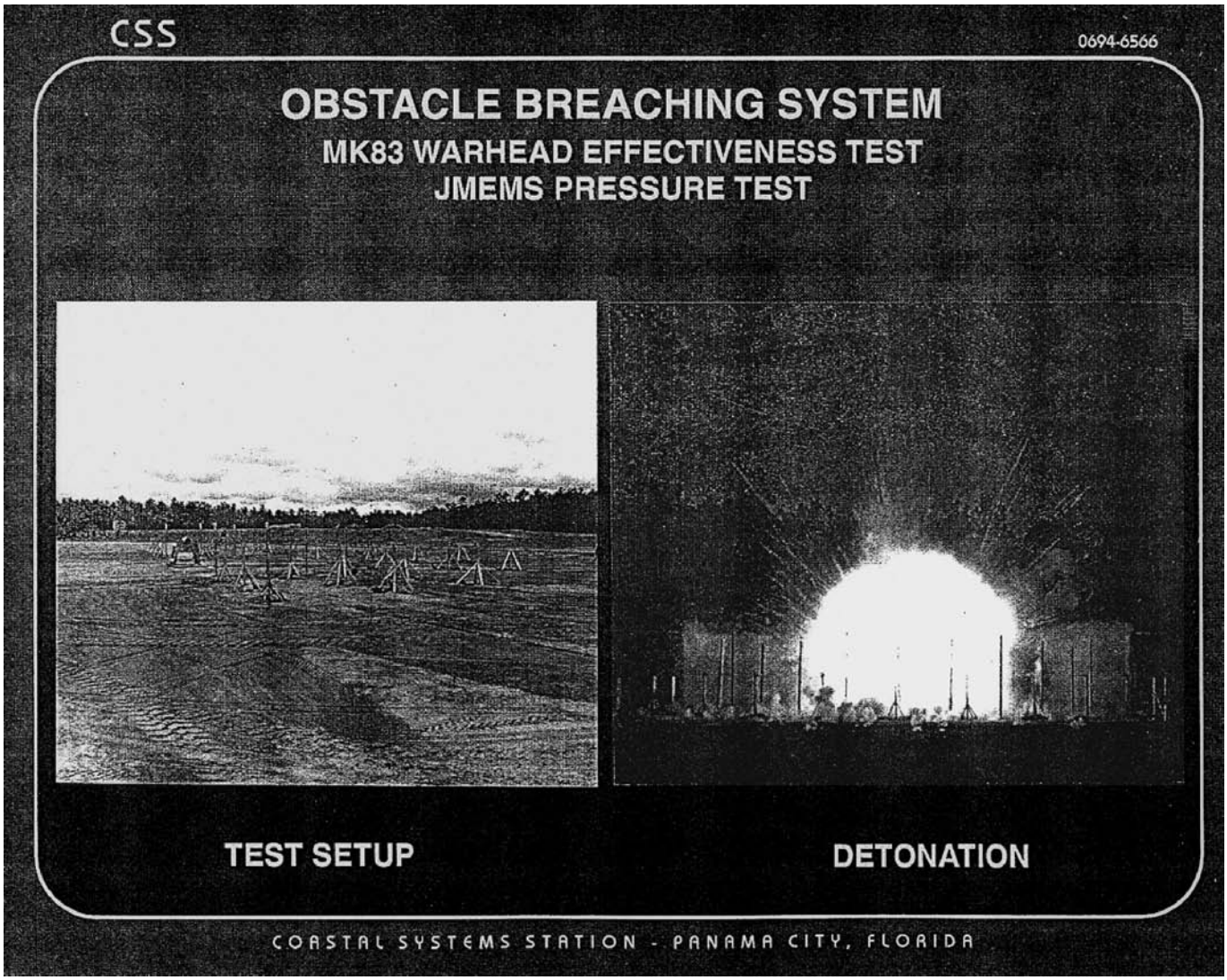
VIEWGRAPH 17
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
WATER PHASE



VIEWGRAPH 18
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
WATER PHASE



VIEWGRAPH 19
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
JMEMS PRESSURE TEST



VIEWGRAPH 20
OBSTACLE BREACHING SYSTEM
MK83 WARHEAD EFFECTIVENESS TEST
FOLLOW-ON TARGET LAYOUT

CSS

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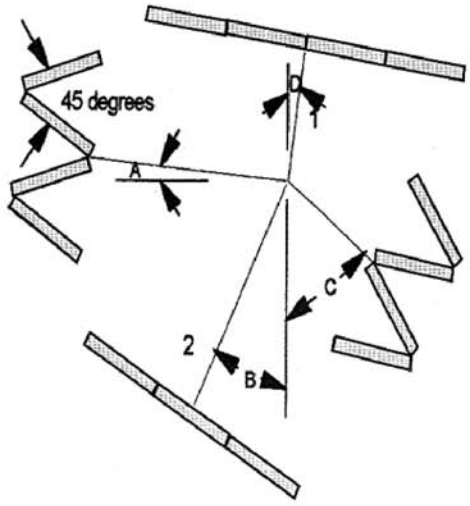
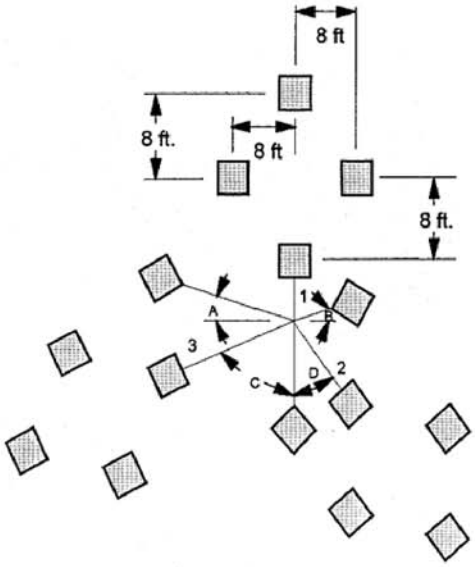
OBSTACLE BREACHING SYSTEM

MK83 WARHEAD EFFECTIVENESS TEST
FOLLOW-ON TARGET LAYOUT



CONCRETE JERSEY BARRIERS



CONCRETE CUBES

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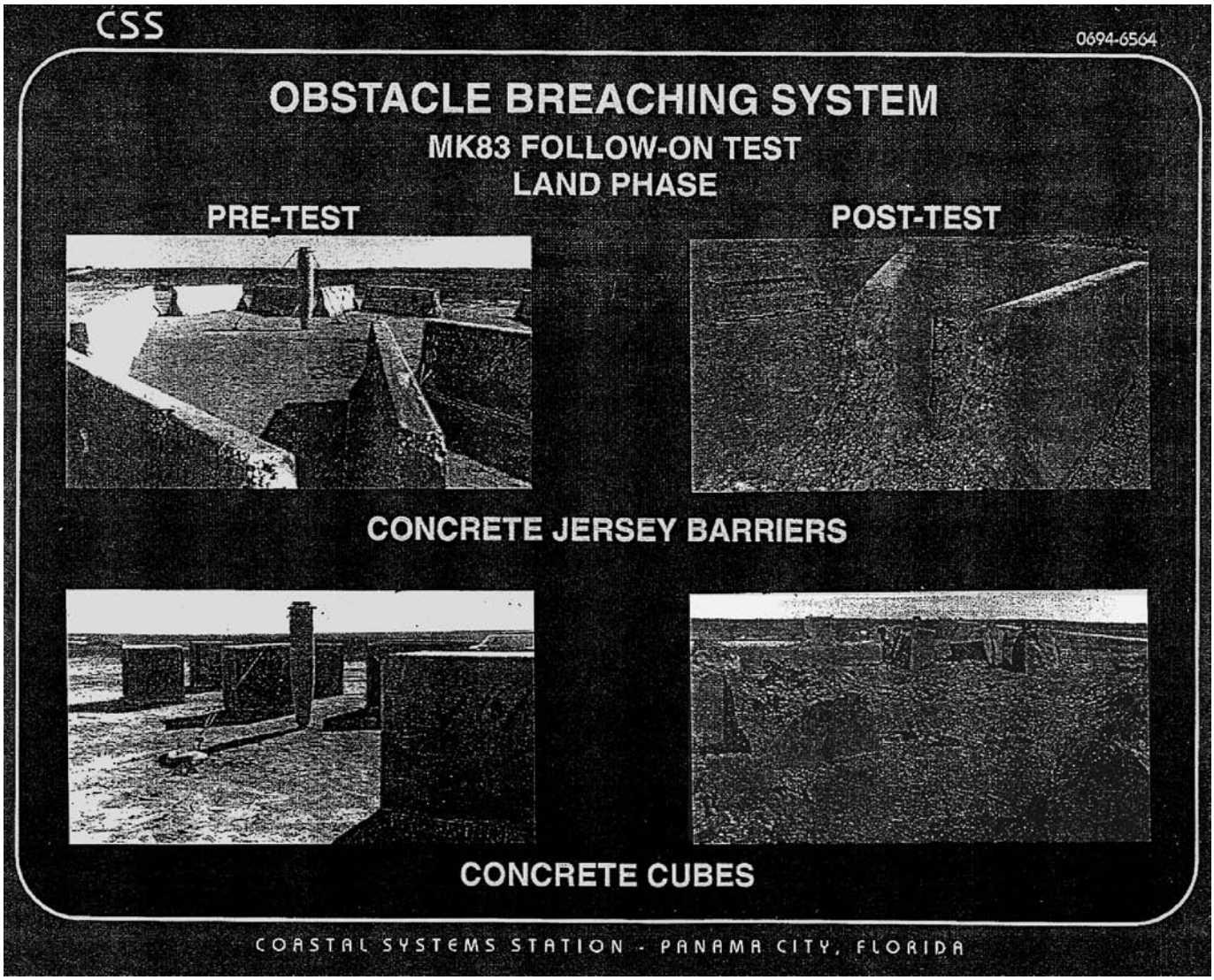
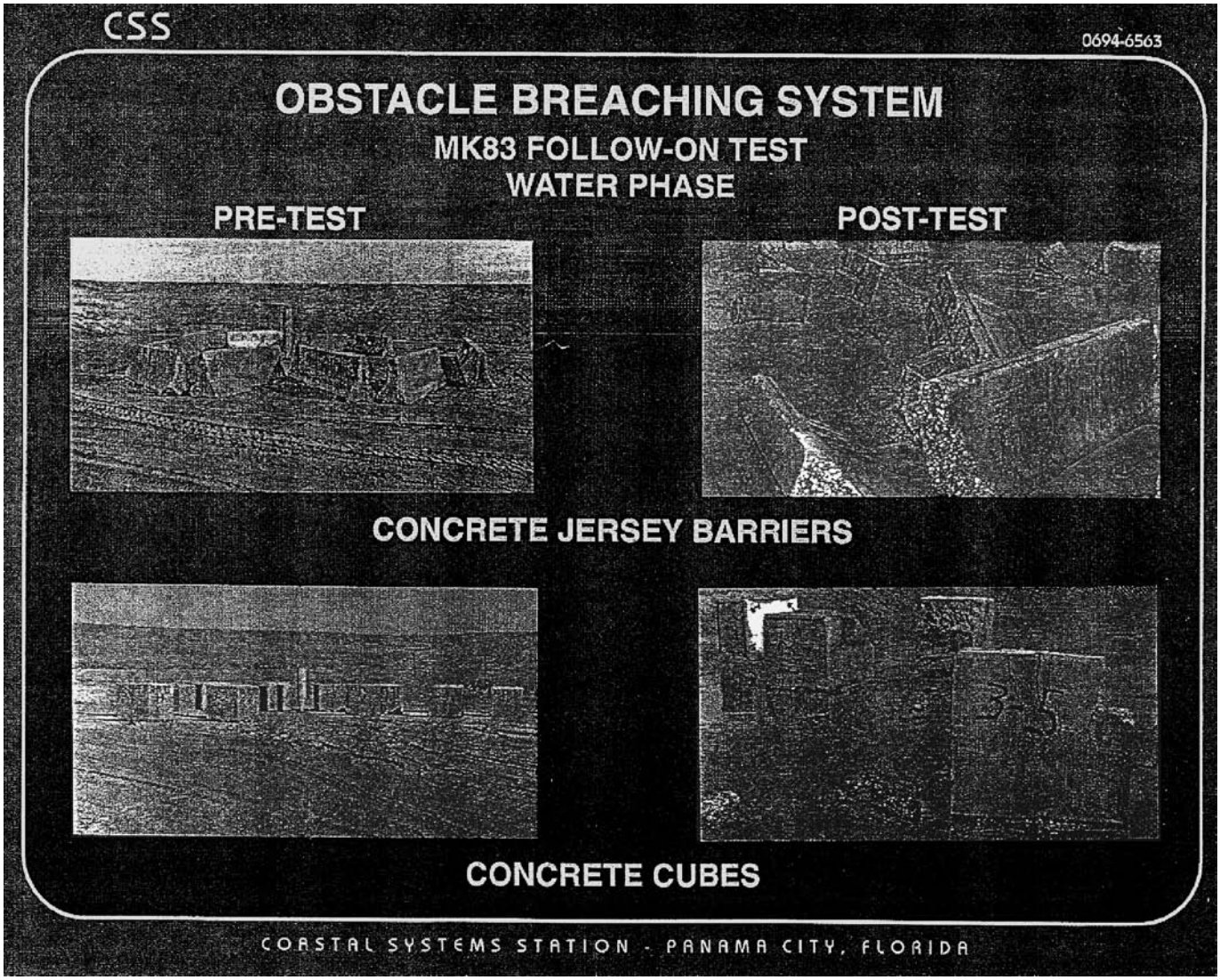
VIEWGRAPH 21
OBSTACLE BREACHING SYSTEM
MK83 FOLLOW-ON TEST
CRATER TEST:25", SANDY SOIL



VIEWGRAPH 22
OBSTACLE BREACHING SYSTEM
MK83 FOLLOW-ON TEST
WATER PHASE